Remotely sensed change product considerations

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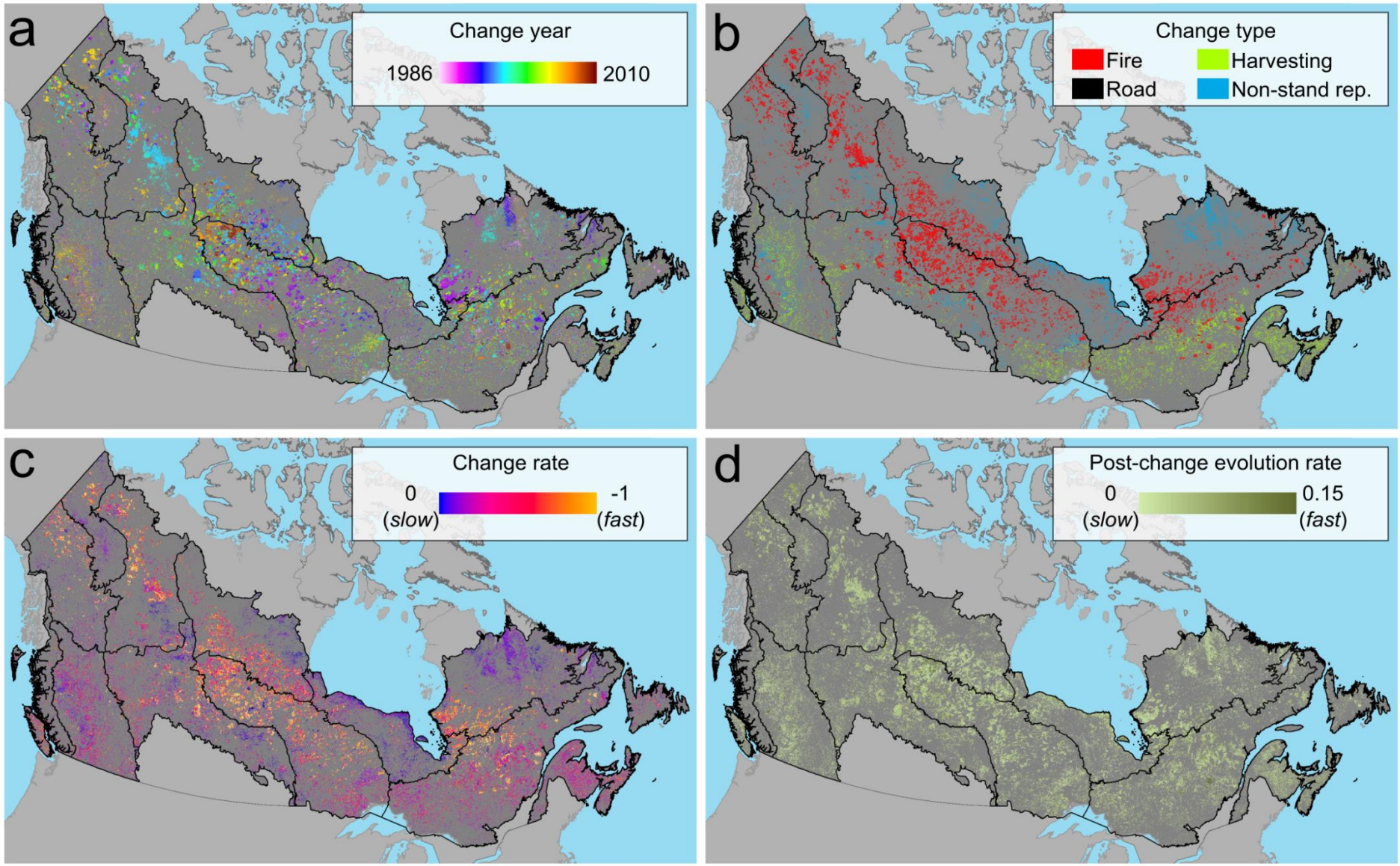
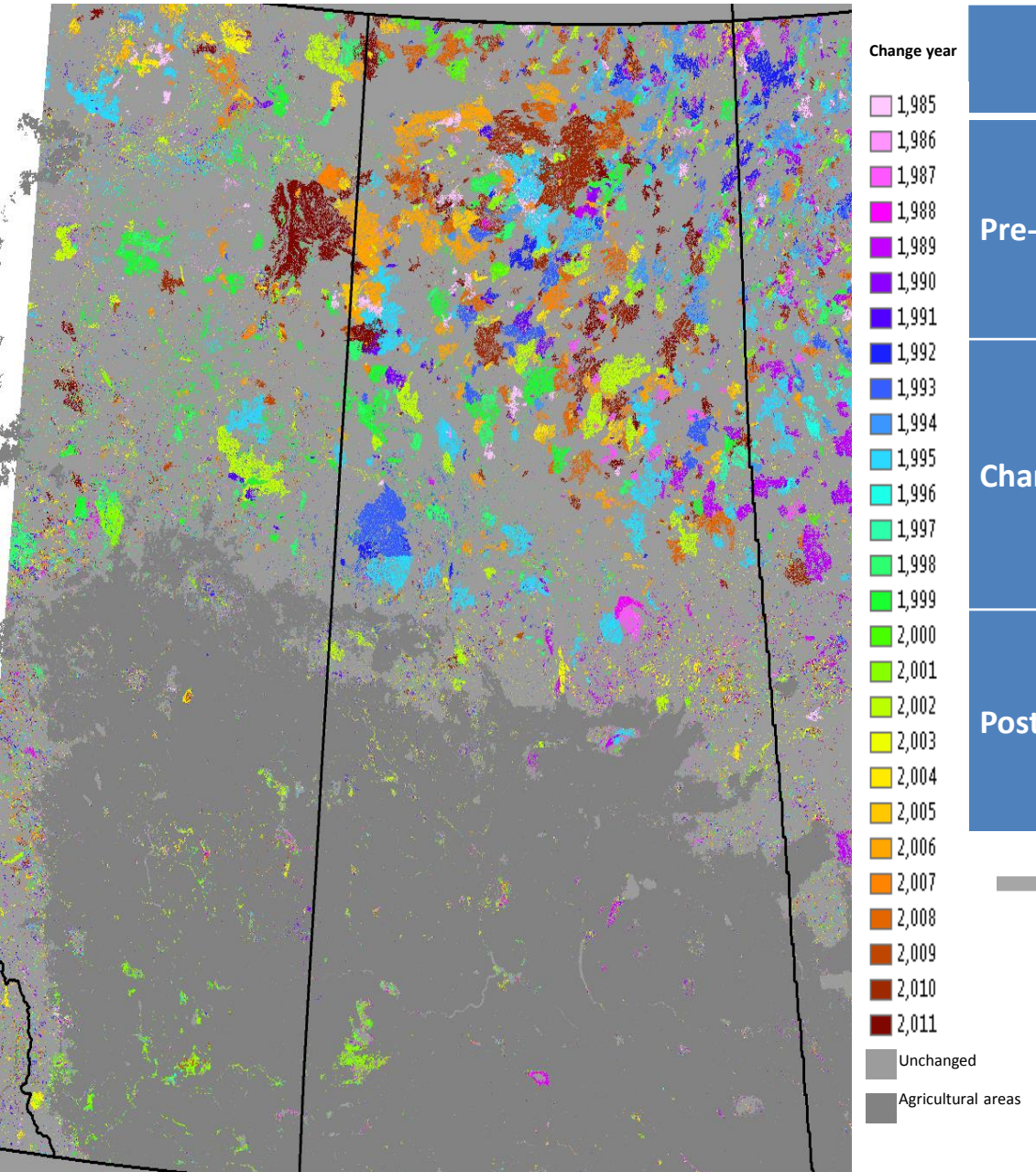
Outline

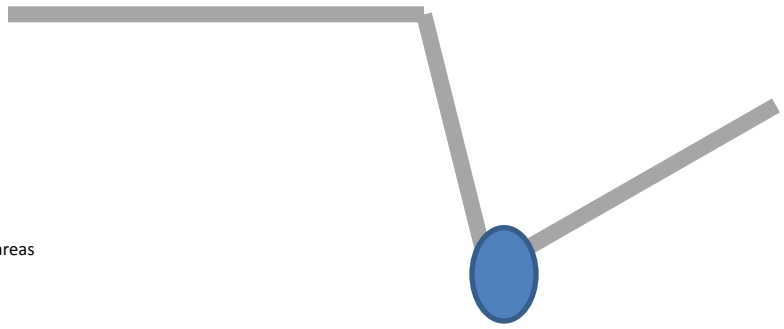
- Nature of change from time series
- Hierarchy of change
  - Change / no-change though to labeled change
  - What is labeled, what is left
- Subtle change, depletions
- Time series change products (pre, during, post)
- Forest recovery (what is related, sensitivity of RS indices)


a
Change year
1986
2010
b
Change type
Fire
Harvesting
Road
Non-stand rep.
c
Change rate
0
(slow)
-1
(fast)
d
Post-change evolution rate
0
(slow)
0.15
(fast)

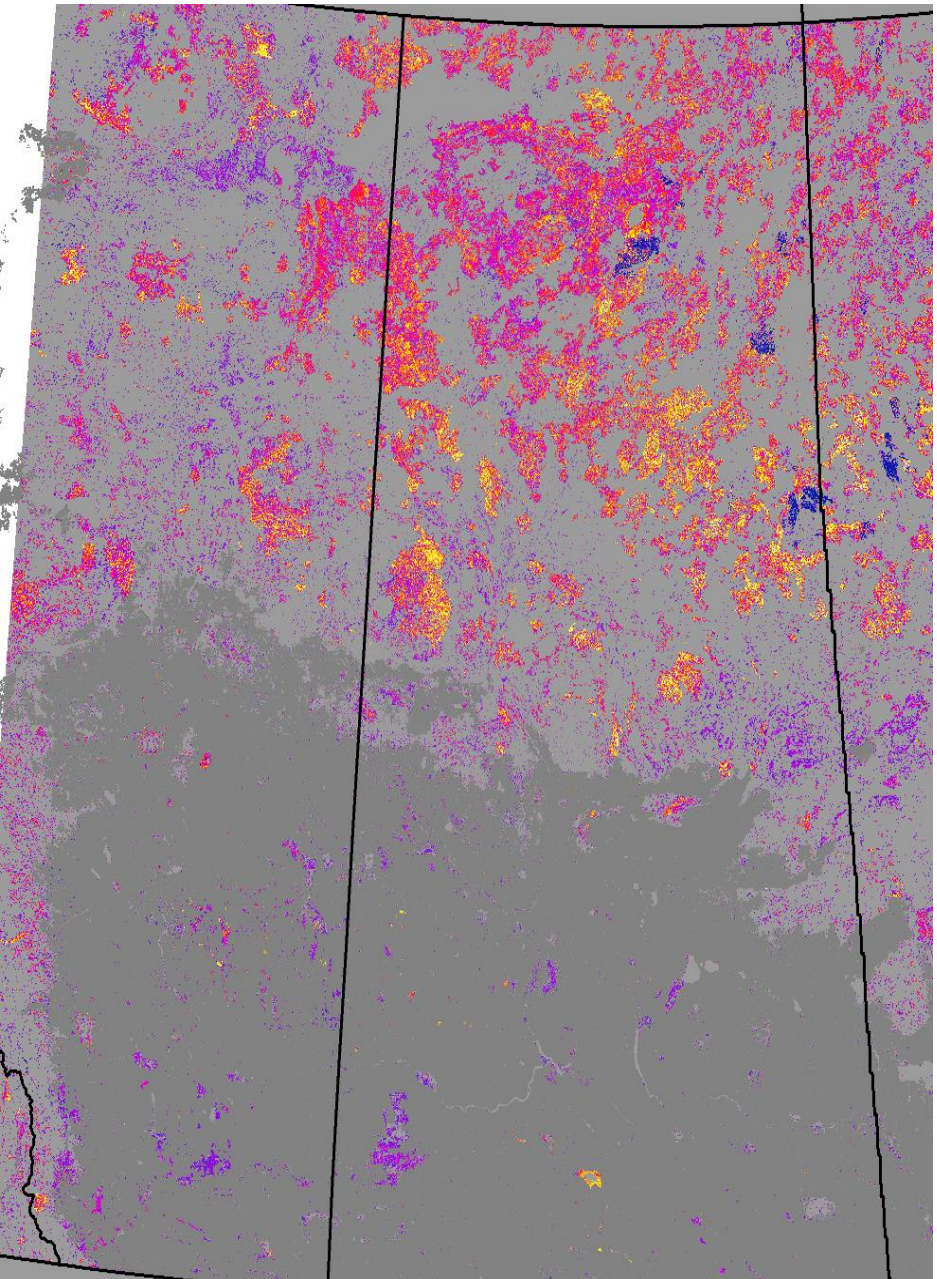
Change detection outputs



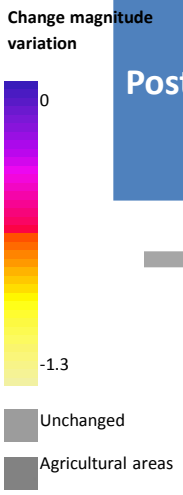
	Metric
Pre-change	Pre-change magnitude variation
	Pre-change persistence
	Pre-change evolution rate
Change	Change year
	Change persistence
	Change magnitude variation
	Change rate
Post-change	Post-change magnitude variation
	Post-change persistence
	Post-change evolution rate

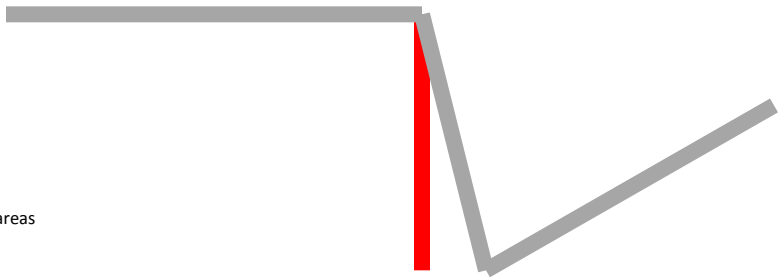


Change detection outputs

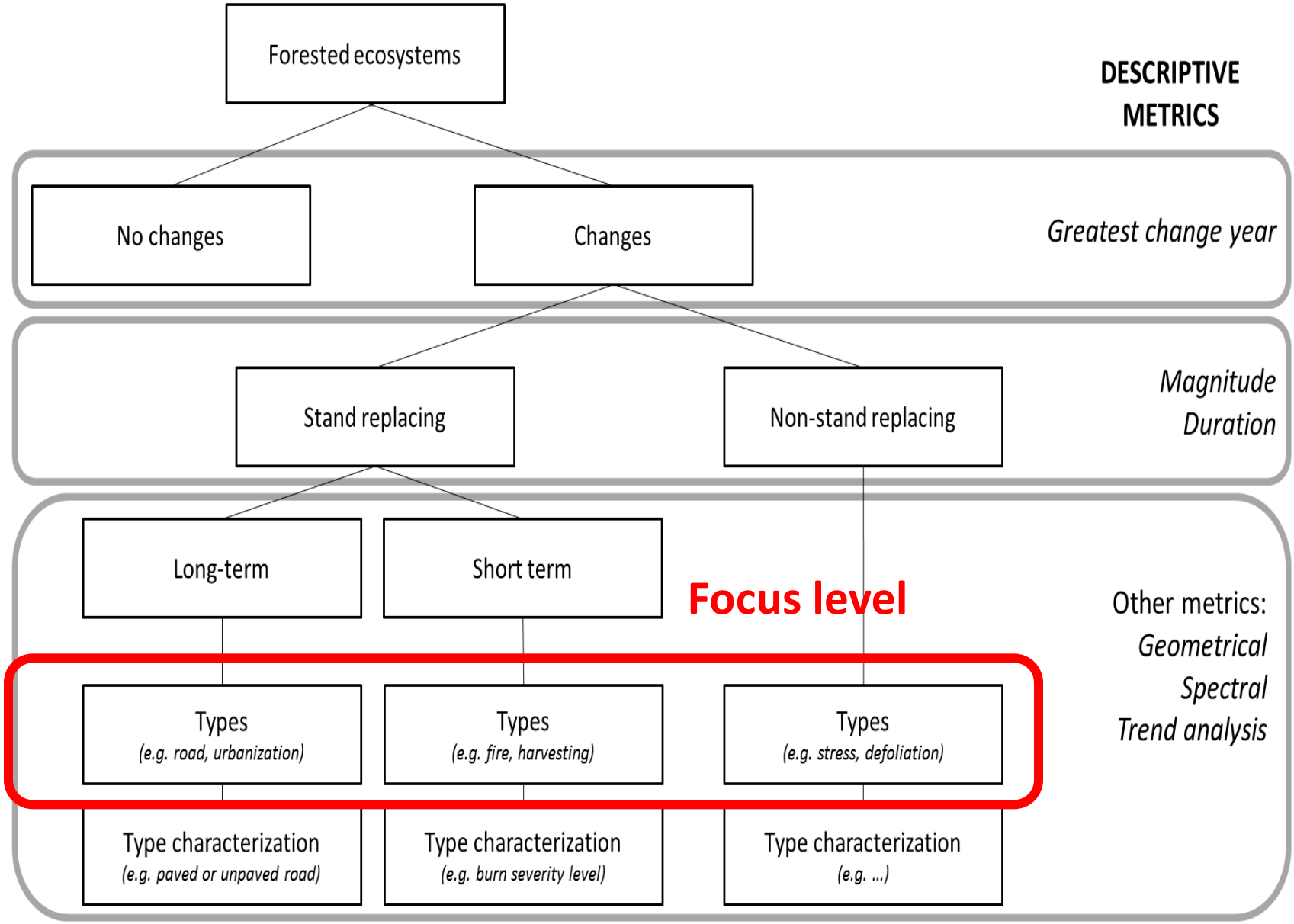


	Metric
Pre-change	Pre-change magnitude variation
	Pre-change persistence
	Pre-change evolution rate
Change	Change year
	Change persistence
	Change magnitude variation
	Change rate
Post-change	Post-change magnitude variation
	Post-change persistence
	Post-change evolution rate



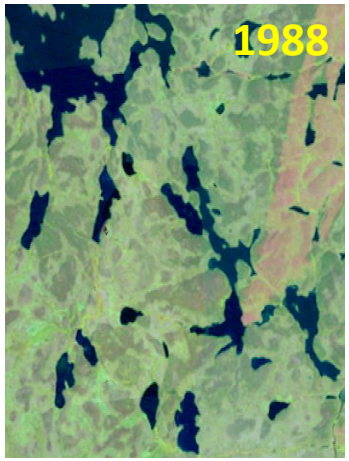


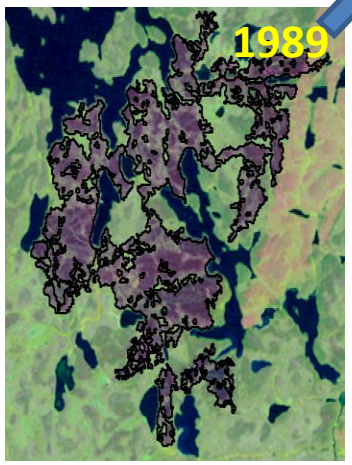
Hierarchy of change

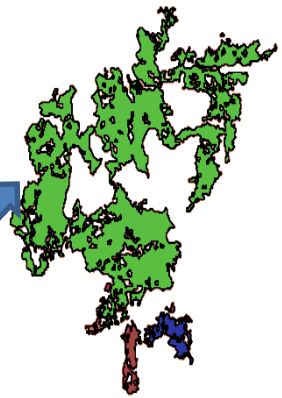


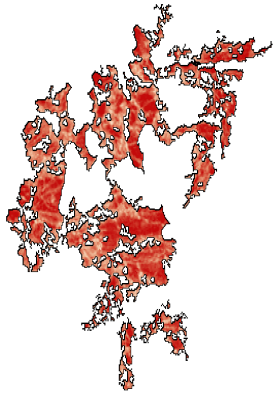
Change attribution

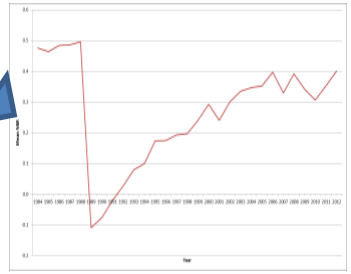
Descriptive Metrics











Geometry

- Area
- Perimeter
- Compactness
- Shape index
- Fractal dimension

Spectral

- Average spectral value pre-change b4, b
- Average spectral value post-change b4,
- Standard deviation value post-change b4
- Average pixel series value b4, b5, b7, NI
- Standard deviation of pixel series values
- Range of pixel series values b4, b5, b7, N

Trend analysis

- Duration
- Average change magnitude variation
- Pre-change magnitude variation NBR
- Pre-change duration
- Pre-change evolution rate NBR
- Post-change magnitude variation NB
- Post-change duration
- Post-change evolution rate NBR

Random Forest

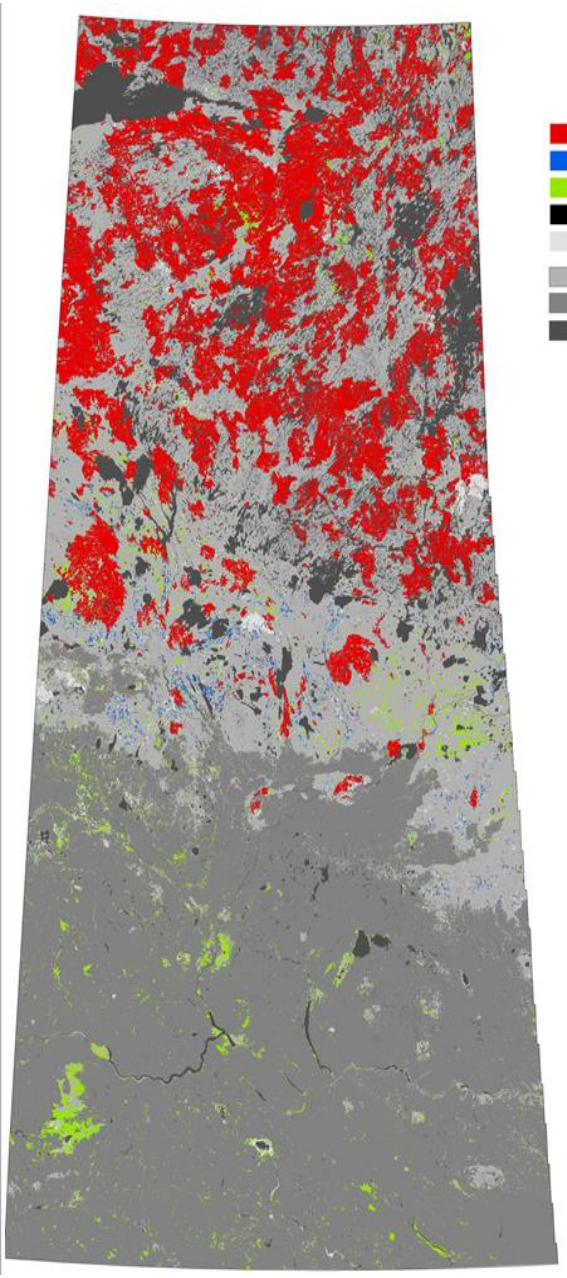
Categories:

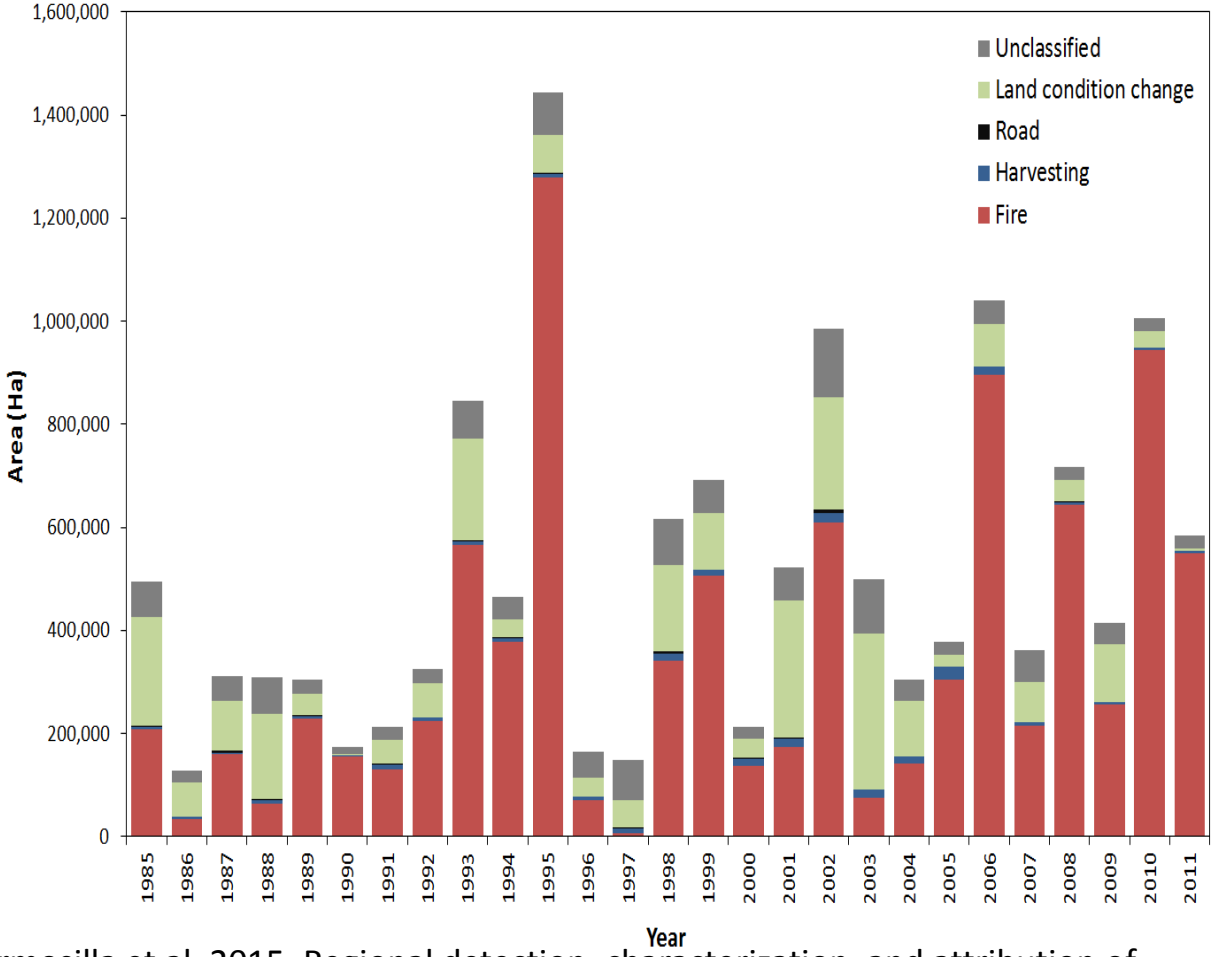
- *Fire*
- *Harvesting*
- *Road*
- *Land condition change*

Low confidence attributions:

- *Unclassified*

Change attribution results (SK)





Hermosilla et al. 2015. Regional detection, characterization, and attribution of annual forest change from 1984 to 2012 using Landsat-derived time-series metrics. RSE. 170: 121–132.

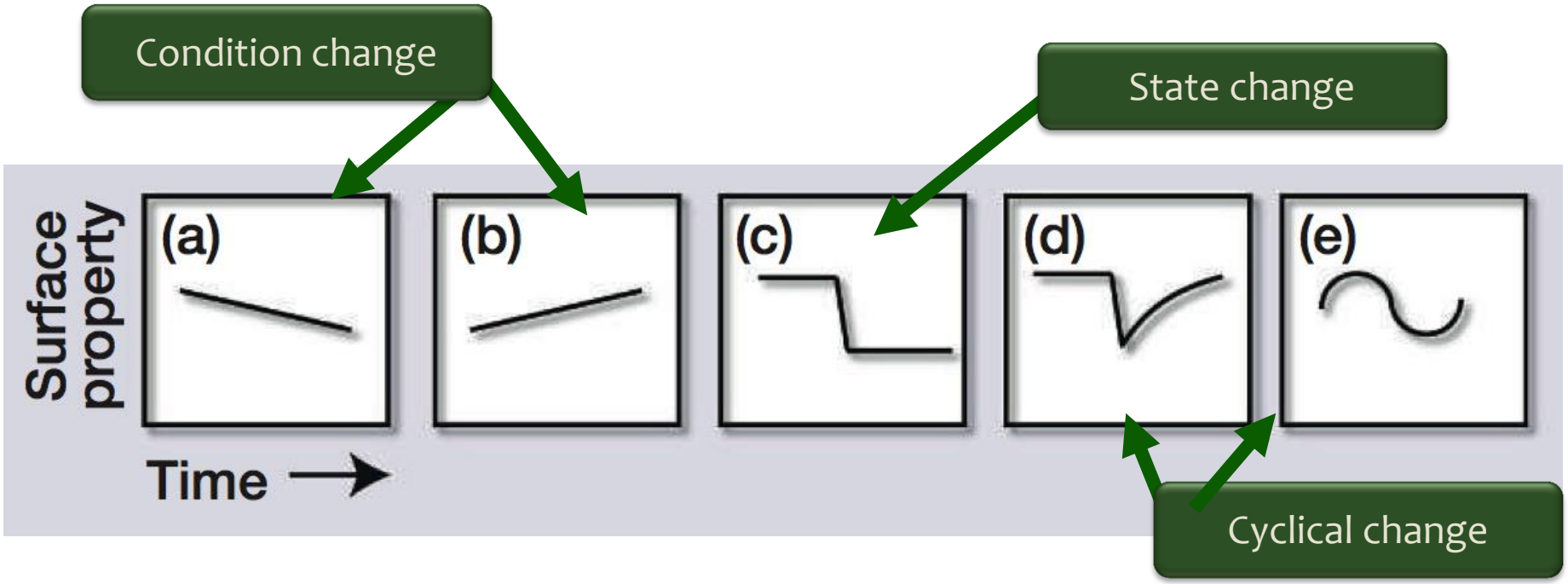
Change product considerations

- Non-stand replacing, or forest related, change
- Algorithms robust in different environments, change agents, ecological conditions, etc.
- Subtle positive change, growth, increasing in canopy cover
- Subtle negative change, stress, defoliation

Kennedy et al. 2014. Bringing an ecological view of change … FEE. 12: 339–346.
Gómez et al. 2011 Characterizing the state and processes of change… RSE. 115(7):1665-1679
Cohen et al. 2015. Forest disturbance … decline… FEM. 360:242-252

Handling other types of change

- Change occurs *all the time*



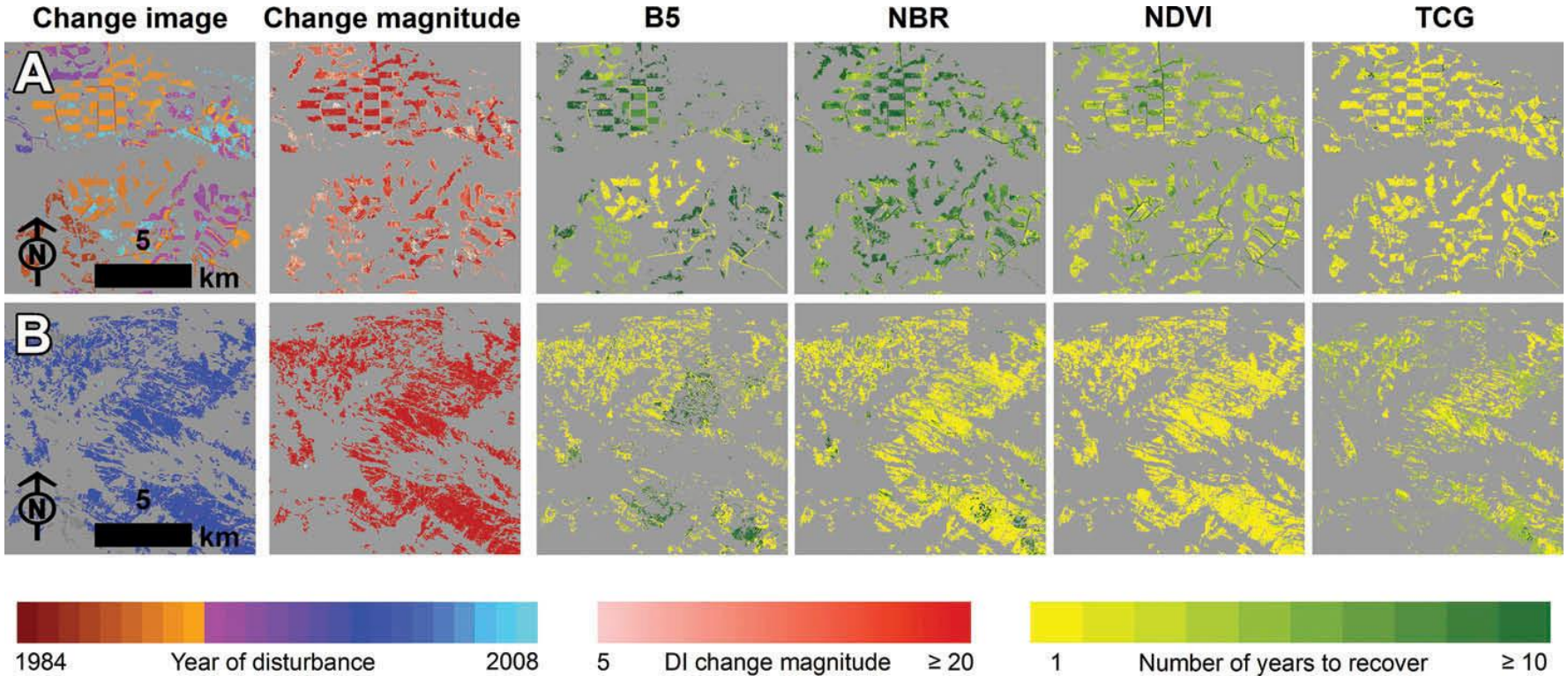
- Temporal grain and extent matter – for product timing and for definitions of products

Aims / considerations for products…

- Require quality assurance (to what level?)
- Require ATBD
- Want to avoid a proliferation of products
- Satisfy a range of users
  - Forest, ag, urban, high latitude ecosystems, etc.
  - Impact on products, algorithms
- How far to go with products?
- Analysis enabling vs outcome products
- Products and tools

“Recovery”

- Perspectives:
  - Ecological, silvicultural, spectral
  - Spectral recovery varies by method & index or band



Pickell et al. 2016. Forest recovery trends derived from Landsat time series… IJRS. 37: 138-149

Thank you!

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Publications:

https://www.researchgate.net/profile/Michael_Wulder

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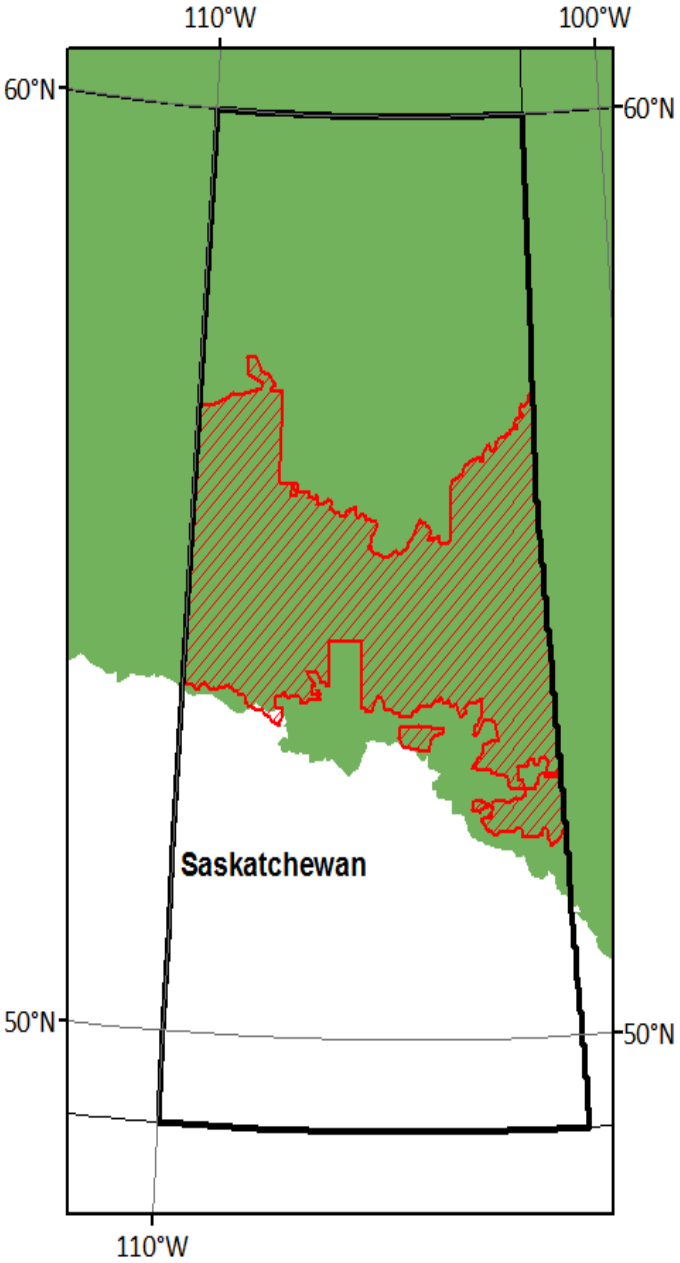

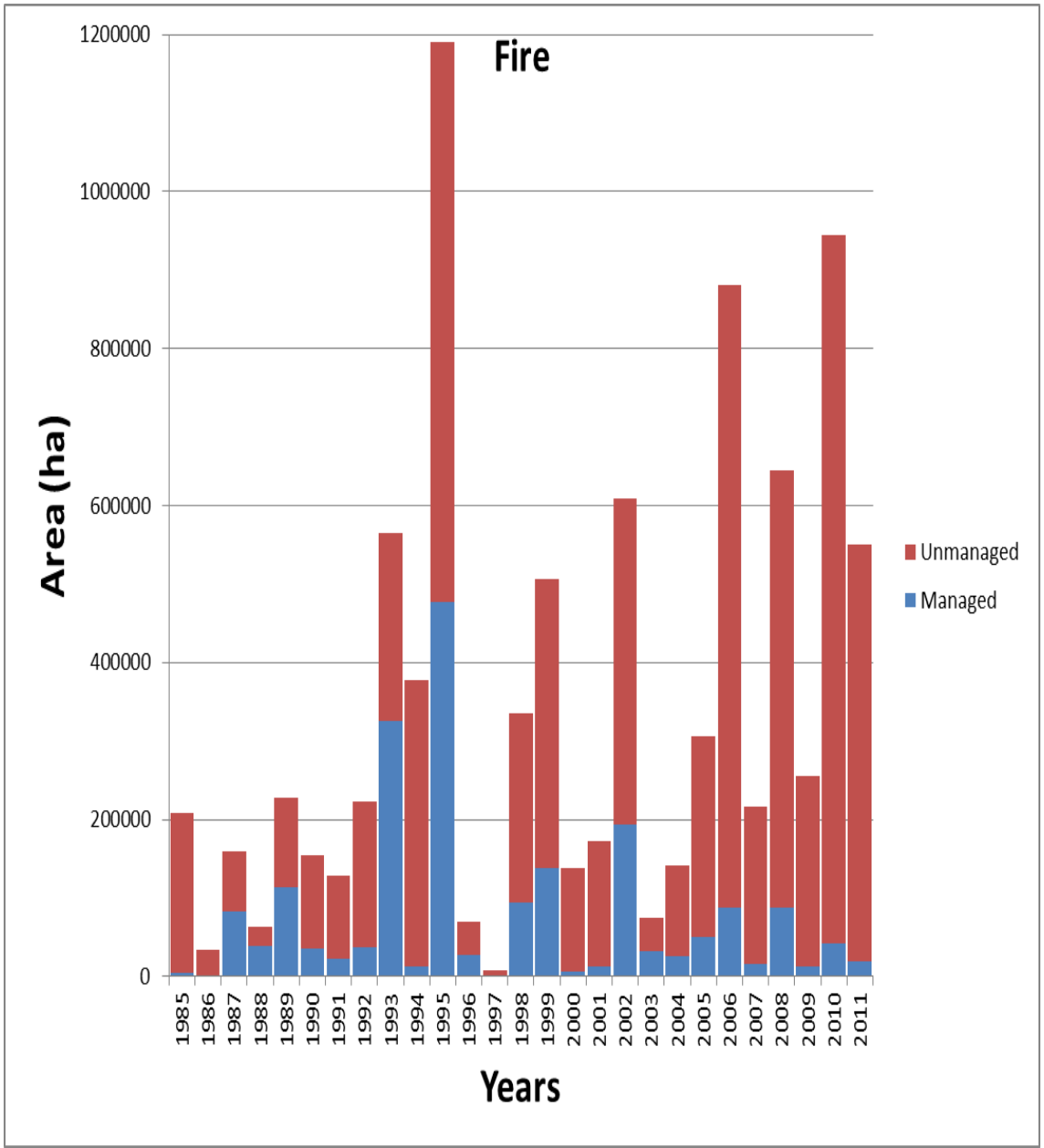
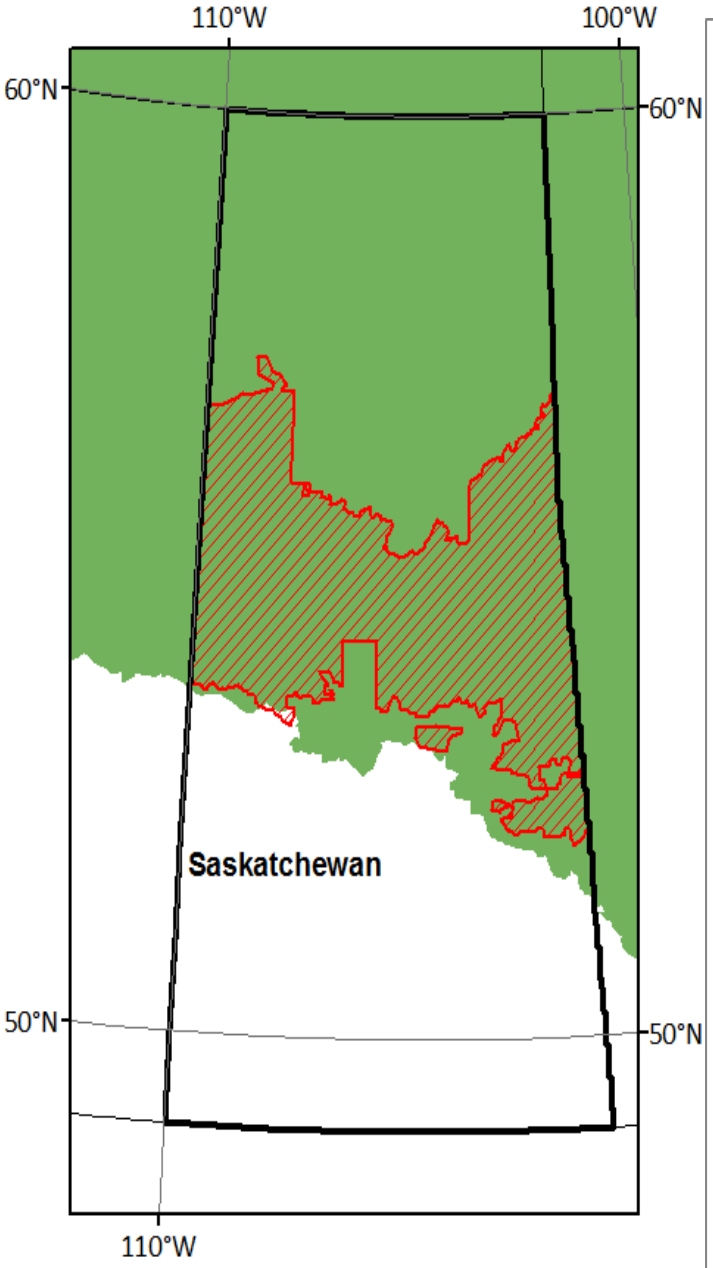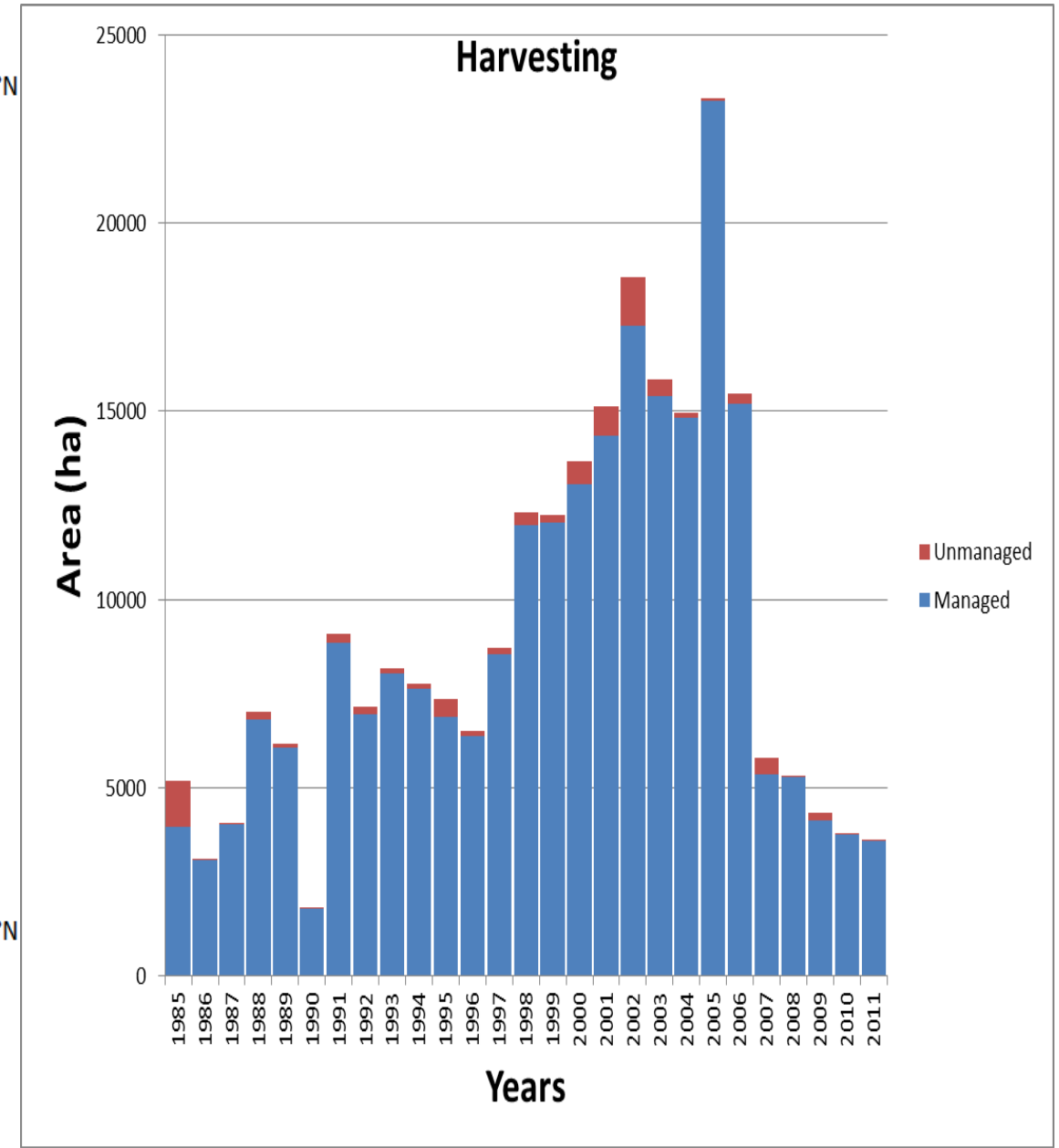
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